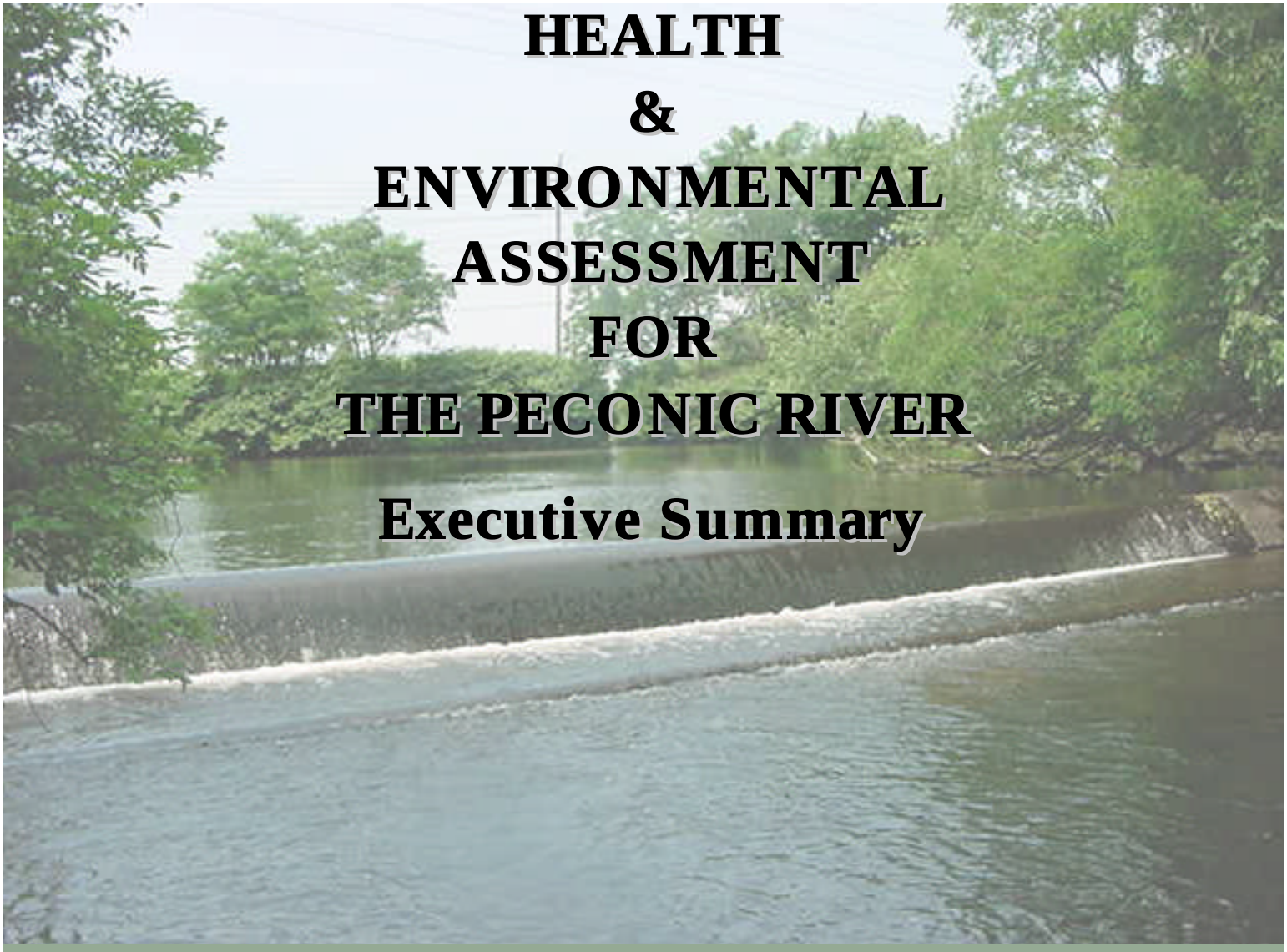

HEALTH & ENVIRONMENTAL ASSESSMENT FOR THE PECONIC RIVER

Executive Summary

Submitted to:

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Executive Summary

In 1999, the Suffolk County Legislature passed Resolution 168-1999. This resolution authorized, among other items, a health and environmental assessment of the Peconic River, due to concerns raised over the contaminants that might be in the river because of releases from Brookhaven National Laboratory. The Laboratory is currently undergoing a "Superfund" cleanup under the supervision of the US Environmental Protection Agency and the New York State Department of Environmental Conservation. This assessment was to be undertaken by an independent investigator, with oversight by the Suffolk County Department of Health Services and a committee appointed by the legislature (the Citizens Oversight Committee).

Cashin Associates, PC was selected to perform this study. Cashin Associates was assisted by a risk assessment subcontractor, Integral Consulting. Cashin Associates began its work in the spring of 2002.

The study was comprised of several distinct tasks. One major effort was an assessment of the environmental setting, including historical impacts to the river since European settlement of the area began. This effort also included the identification of potential sources of contamination to the river and its watershed. A second major effort was a qualitative survey of angler habits and fish consumption along the river. The third major effort was the search for and evaluation of all environmental sampling reports associated with the river and its environs, made over the past 30 years or so. Organizations found to have considerable data sets included the US Geological Survey, Brookhaven National Laboratory, the US Department of Energy, the US Navy, several branches of the Suffolk County Department of Health Services, and the Suffolk County Planning Department. The data was then transformed into a single format so that it could be analyzed as part of the health and environmental assessment.

The health and environmental assessment process consisted of the following steps:

- identification of potential contaminants of concern
- descriptions of the concentrations associated with the identified contaminants
- determinations of potential pathways to receptors (either human or ecological populations)
- determination of the potential for impacts given the environmental concentrations and the pathways
- calculation of the hypothetical increase in cancer or toxicological risk for the receptors of interest.

Finally, the contaminant releases from the Brookhaven National Laboratory sewage treatment plant were quantified, and means of determining the fate and transport of these contaminants

were assessed to allow for a more complete understanding of where the contaminants may now be and what that may imply.

The study found that the river has experienced major impacts from human use. Some of the impacts occurred as early as the 17th Century. The construction of dams along the river may have created the warm-water stream that currently exists, and so may have changed the ecological community that was originally present to the one now residing in and along the river. Whether or not the cause is anthropogenic, the river and its watershed now contain at least 24 distinct ecological communities. In these communities, 86 species have either State or federal endangered or threatened species status. This assemblage of communities and species of concern, signs of the area's biodiversity, has helped focus preservation efforts on this region, including the designation of the Pine Barrens State Forest Preserve.

The river has served as an important driver of area commerce, through mills, iron mining and forging, ice making, goods transport, and duck and cranberry farming. The river has also served as a repository for various wastes, and has received discharges impacted by local enterprises. These include treated and untreated duck wastes, human wastes released following passage through residential septic systems and larger sewage treatment plants, and groundwater and surface water inputs contaminated by agricultural, industrial, or development-related contaminants.

This study has confirmed that the Brookhaven National Laboratory sewage treatment plant has been the primary source of contaminants of concern to the river. There have been some smaller impacts from compounds generally thought to be less toxic than the Brookhaven releases, primarily from development related activities over the past several decades. However, several potential environmental contaminant sources, such as duck farms and the Superfund sites at the Calverton test site and Hazeltine-Europe, did not prove to have detectable effects according to the accessed data sets.

Laboratory-related contaminants were found in groundwater, surface water, river sediments, and biota. The greatest risks associated with the contamination of the river are those relating to toxic impacts from the consumption of fish. This is due to the high levels of PCBs and mercury. The risks are greatest for children, but maximally-exposed adults also face increased risks well above background levels in all areas of the river. The Cashin Associates fish consumption survey had found that some people catch large numbers of fish from the river, and some eat more than 50 meals a year of such fish. In addition to PCBs, DDT, DDE (a breakdown product of the pesticide DDT) and radionuclides (in general) contribute to the cancer risks associated with the consumption of fish. Although the highest risks were associated with consumption of fish in the upper reaches of the river, risks were elevated further downstream and in the river as a whole.

The health risk assessment also found that contaminated groundwater, known to have been consumed historically, resulted in increased risks for exposed populations for both cancer and other toxic impacts. The contaminants of concern were two solvents (trichloroethene and 1,2-

dichloroethane), tritium, arsenic, and thallium. Although public water is currently available, should groundwater be used for drinking water purposes in the future, contamination by thallium and arsenic would represent an elevated risk.

The human health risk assessment found that risks associated with potential direct contact with sediments and external radiation exposure from cesium-137 posed a minimal risk.

The ecological risk assessment found a potential impact to invertebrates living in the river sediments, from exposure to elevated concentrations of metals (including mercury, silver, barium, cadmium, copper, selenium) and certain detected pesticides. In addition, the analysis suggested that the mercury contamination levels could bioamplify up the food chain, and therefore could present a concern for fish-consuming organisms.

The kingfisher had been identified as a good indicator organism for area ecological impacts, as it is resident on the river and solely consumes fish. Extensive literature on piscivorous ducks strongly suggests that the mercury concentrations measured in Peconic River fish could inhibit reproductive success. If this literature applies to kingfishers, as was the assumption of the ecological risk assessment, kingfisher populations could very well be impacted by current mercury contamination levels. Kingfishers were used as a surrogate for all piscivorous fish in the Peconic River area, and, therefore, these other birds share the risks identified for the kingfisher.

Therefore, the contaminants identified as being of primary concern for the future were:

- PCBs (for potential human health impacts from fish consumption).
- mercury (for potential human health and ecological impacts due to its concentrations in fish)
- cesium-137 (for potential human health impacts from sediments)

Mercury and PCBs are the contaminants of greatest concern, though mercury represents a greater risk further downstream from Brookhaven National Laboratory than has been determined for PCBs. Risks from exposure to mercury and PCBs are associated with the consumption of contaminated fish by people, and to wildlife that consume fish, such as piscivorous birds.

One important area of uncertainty for these analyses is an incomplete understanding of the potential health effects from exposure to chemical mixtures. The standard approach in risk assessment is to assume that chemicals essentially are additive in their total toxic effect. However, some data show certain chemicals can be synergists or potentiating agents, so that the combined toxicity of the chemical mixture is greater than the sum of their individual toxic effects. This kind of information from specific chemical combinations cannot be reliably extrapolated to other chemical combinations. As a result, possible potentiation or synergy among the chemicals analyzed in this report was not evaluated in the risk assessment.

The amount of contaminants released into the river from the Brookhaven National Laboratory sewage treatment plant was estimated as best as possible. It was hoped that this information, coupled with other environmental sampling data and information about the river, would support the use of computer fate and transport models to estimate where the contaminants might have traveled, and at what concentration they might be found in areas that have not been sampled yet. However, the complexity of the flow system of the river and lack of relevant data to support the models made it clear that would not be possible under the project time and resource constraints. Instead, a comparison of mercury concentrations and cesium-137 activities in two different parts of the river was used to determine that these compounds did not vary in a consistent fashion from near the sewage treatment plant to areas further downstream. This finding made it impossible to conclude a single mechanism (such as sediment transport) was responsible for contaminant distributions in the river's sediments.

Generalized assessments of the contaminants in the various media were made. As a result, it seems that groundwater contamination from the Brookhaven National Laboratory sewage treatment plant may not be a significant problem for overall Peconic River water quality, due to the travel time considerations and where and how the aquifer discharges to the river. Sediment transport dynamics and water chemistry considerations clearly were important in determining the future of most contaminants released from the sewage treatment plant to the river, however. The report suggests that monitoring of the river be modified to address some of these information gaps. Denser and more frequent collection of information regarding flow in the river and the amount of sediment carried in the river at any one point was identified as a key focus. Another area to collect better information would be the inflow of groundwater to the river. Finally, the analysis of river water for major ion species would allow for geochemical determinations of whether particular compounds precipitate or dissolve in the river – and so help create new information to determine where chemicals settle into river sediments, and where they may be mobilized into the water column.

The following five overall management policies were identified:

1) A long term monitoring program to assess mercury and PCB levels in Peconic River fish should be implemented.

2) Additional monitoring should be conducted to systematically determine flows in different areas of the river, to calculate sediments fluxes from one point on the river to another, and to support analyses of mineral phase/dissolved phase distributions of contaminants in the river and its sediments.

3) Potential sources of mercury to the food chain should be reduced. Source controls to limit releases from the sewage treatment plant and remediation of areas of higher concentrations in river sediments should be priorities. Current mercury concentrations are great enough in the sediments and fish of the river that impacts to piscivorous bird and people are possible. Without reducing the sources and sinks for this metal, the situation may be slow to improve.

4) The New York State Department of Health has a general health advisory that no one should consume more than one meal (one-half pound) per week of sportfish taken from the state's freshwaters. This advisory currently applies to the Peconic River. The New York State Department of Health should continue with their outreach and public educational efforts regarding this advisory.

5) Since parameters indicating impacts from road run-off have shown an increasing trend in the Peconic River over the course of several decades, stormwater and non-point source run-off controls should be considered.